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Notes for Libraries and Research Institutes.

FORMER ISSUES OF AGRICULTURAL JOURNAL.

So many requests are received from abroad for parts of the *Agricultural Journal* which were never published that the following list of all issues published and those which are not now available is given for reference. Attention is especially directed to Volume 7 which had only one part:—

Vol.			*Vol.*		
1.	3 numbers,	1928.	10.	4 numbers,	1939 (none of Nos. 2 and 4).
2.	4 „	1929.	11.	4 „	1940 (none).
3.	3 „	1930 (none).	12.	4 „	1941 (none of Nos. 1 and 2).
4.	4 „	1931.	13.	4 „	1942.
5.	2 „	1932 (none of No. 2).	14.	4 „	1943.
6.	2 „	1933.	15.	4 „	1944.
7.	1 „	1934.	16.	4 „	1945.
8.	4 „	1935–37 (none of No. 4).	17.	4 „	1946 (none of No. 1).
9.	4 „	1938 (none of Nos. 2, 3 and 4).			

ISSUES OF THE AGRICULTURAL CIRCULAR.

NUMBERS and year of issue of the *Agricultural Circular*:—

Vol. 1,	1920,	12 numbers.	Vol. 4,	1923,	1 number.
2,	1921,	5 „	5,	1924–5,	2 numbers.
3,	1922,	4 „			

As number 4 of Vol. 3 was printed as " Volume 4 " and number 1 of Vol. 4 as " Volume 5 " it would appear from an inspection of a complete set that Volume 4 comprised only a number 4 and that there were two issues of Volume 5, No. 1.

ANNUAL BULLETINS.

THE Annual Bulletin of Divisional Reports ran from 1931 to 1938 and was then discontinued.

OLD ISSUES OF AGRICULTURAL BULLETINS.

FREE copies of the following Bulletins are available to Colonial Departments of Agriculture research institutes and bona fide planters within the Colony.

No. 1. Sisal Hemp in Fiji, 1911.
3. Rhinoceros Beetle in Samoa, 1912.
4. The Banana in Fiji, 1912.
5. Scale Insect on Bananas, 1913.
6. Lemon Grass, 1913.
7. A Mission to Java for a Coleopterous Pest of Bananas, 1914.
8. Coconut Experiments, 1915.
9. Soils of Fiji—I, 1916.
11. Alluvial Soils of Fiji, 1919.
12. Leaf Moth of Coconuts, 1919.
13. Sea Island Cotton, 1920.
14. Transparent Coconut Scale, 1921.
15. Purple Leaf Moth of Coconuts, 1924.
18. Control of Coconut Spike Moth, 1935.

The following are available to the public at the prices shown—

No. 21. Biological Control of the Rhinoceros Beetle, 1941. Price 1s.
21A. Fijian Plant Names, 1942. Price 3s. 6d., 4s. and 6s.
22. An introduction to the Mosquitoes of Fiji, 1943. Price 1s.
23. Insect Pests in Fiji, 1946. Price 1s.
Gardening Notes, Insect Pest Control and Plant Diseases, 1945. Price 1s.

Applications should be made to the Librarian, Department of Agriculture, Suva, Fiji.

—EDITOR.

Agricultural Journal

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DEPARTMENT OF AGRICULTURE.

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EDITORIAL . . .

ADVISORY COUNCIL ON AGRICULTURE.

One of the recommendations of the statement of policy and action for agriculture debated in Legislative Council at the February, 1945, session was the "establishment of a standing advisory committee on agriculture, which would be representative of the major agricultural industries of the Colony, in order that the direction of the work of the Department of Agriculture should be co-ordinated with the agricultural and general development of the Colony". Those recommendations of the memorandum concerning the reorganisation of the Department of Agriculture are being implemented as funds, personnel, land and materials slowly become available, but the setting up of the Advisory Council was effected by the publication in the *Fiji Royal Gazette* of the 14th November, 1947, of the names of the members of the Council with the following terms of reference:—

> "To advise on, and from time to time review, the approved agricultural policy of Government and to make recommendations on other matters submitted to the Council by Government".

The first meeting of the Council was opended by His Excellency the Governor in the library of the Department of Agriculture's Suva office on the 31st March and in welcoming members His Excellency expressed the hope that the Council would play an important part in promoting the further development of agriculture in the Colony and that it would ensure the co-operation between the Department and the farming community which was essential if the work of the Department was to be fully effective.

A department of agriculture is an organisation of complex function because it operates to assist an industry which is itself a complex of widely different pursuits and skills and, under colonial conditions, with a range of efficiency from primitive subsistence farming through peasant farming with the plough and bullock to the organised and capitalised plantation; an industry moreover that is subject not only to the influence of changing conditions of supply and demand, labour and other costs which affect all industries alike, but also to the wholly or partly uncontrollable factors of weather, pests and disease, as well as the still uncertain factor of soil fertility. In a period of expansion, such as the present, the direction of department effort towards the most pressing of a number of development projects, all competing for priority, is indeed a problem in itself and it is small wonder that the Department is frequently criticized for its apparent neglect of particular issues. Nevertheless no man is perfect and no organisation composed of men can be omniscient; the Department no doubt makes mistakes both of commission and omission, and it is rightly criticized for these mistakes, but genuine criticizm must somehow be directed into constructive channels.

This is where the Advisory Council must play its part in securing the co-ordination of the work of the Department with the requirements of the various branches of the industry; this cannot be left entirely in the hands of the Department. Individual officers of the Department are often referred to as "agricultural experts"—a misleading term because it connotes specialised knowledge of any and all branches of agriculture, an attainment beyond the capabilities of any man. The Department must, rather, be regarded as a team which includes specialists in many branches of agricultural science as well as general workers, but the team is not complete unless it includes the farmer and planter who are (if they are to be successful) specialists in their own sphere which is the study of local weather conditions as they affect farming operations and the growth of crops, the capabilities and limitations of their labour force with the available equipment, and the response to be expected from the soil of the farm. The Council represents the farmer and planter and it is to be hoped that the practical knowledge and experience that they will bring to bear in the formulation of programmes of work will secure an increasing measure of success in developing the Colony's agricultural industries.—C.H.

STAFF NOTES.

Mr. R. A. D. Kable, M.B.E., (Mil.), Produce Inspector proceeded on leave to Australia on the 9th April, 1948.

Mr. C. R. Vasey, was promoted to the post of Senior Agricultural Assistant with retrospective effect from the 1st January, 1948, and was appointed to act as Produce Inspector with effect from the 9th April.

Mr. F. E. M. Warner, whose secondment to the Registrar-General's Department terminated on the 5th April, resumed duty as Marketing Officer on that date.

Mr. T. L. Mune, Livestock Officer, resumed duty with effect from the 27th April, 1948.

Mr. W. I. Laing, was appointed Agricultural Assistant with effect from the 14th April, 1948.

Mr. J. W. Parham, was appointed Laboratory Assistant with effect from the 8th April, 1948.

I. M. Lenati, Junior Veterinary Assistant, was promoted Veterinary Assistant with effect from 1st March, 1948.

OVERSEAS VISITORS.

On 1st April a party of Australian farmers, through-passengers on an organised tour to study farming methods in U.S.A., Canada and the United Kingdom, were taken by the Senior Livestock Officer on a visit of inspection of certain dairies, a piggery, the Fijian Cooperative Market at Nausori, the Rewa Cooperative factory at Waila, and the flock of White Leghorn poultry at Tamavua Hospital. As notice had been too short to permit of any special preparations being made to receive the visitors, it is all the more gratifying to be able to record that their impressions were very favourable.

AGRICULTURAL NOTES . . .

FOOD AND CASH CROPS GROWN BY CANE FARMERS 1947/1948

The following record of subsidiary crops grown by cane farmers during the period 1947/1948 has been made available by the Chief Manager in Fiji, Colonial Sugar Refining Company Limited.

FOOD AND CASH CROPS CULTIVATED BY CANEGROWERS—1947/1948.

Crop.	District.					Total acres.
	Nausori.	Penang.	Rarawai.	Lautoka.	Labasa.	
Pulses (arhar dhall). ..	..	4	352	435	42	833
Pulses (other var.)..	10	304	394	2,183	155	3,046
Maize	..	35	299	353	59	746
Peanuts.. ..	..	24	66	...	...	90
Vegetables ..	5	...	126	...	37	168
Roots	17	41	...	...	49	107
Total (acres) ..	32	408	1,237	2,971	342	4,990

A similar record for the previous year was published in this Journal(1) reference to which shows that the principle changes involve maize and peanuts with a reduction in area of 871 acres (54 per cent) and 811 acres (90 per cent) respectively.

The area under arhar dhall increased by 384 acres (85 per cent) while that under other varieties of pulses decreased by 1511 acres (33 per cent).

REFERENCE.

(1) 1947: Agricultural Notes 6. Food and Cash Crops grown by Canegrowers. *Agric. Jour.* Fiji Vol. 18 No. 2, 52.

B.E.V.P.

CONTROL OF PASTURE WEEDS IN TAILEVU

BY A. D. MERCER (DIP. AGRIC.)

The chief function of the successful grassland farmer is so to adjust and hold the balance between the grazing animal on the one hand and desirable pasture species on the other, as to ensure an adequate feed supply to his herd throughout the season, while at the same time maintaining the dominance of useful plants in his pastures. If this balance is weighted in favour of the grazing, the more palatable and nutritious species must inevitably disappear, and be replaced by the less desirable grasses and weeds. This process has been carried to the extreme on most of the dairy pastures of Fiji, with the result that weeds are dominant to such an extent that the average pastures maintains not much above 30 per cent of useful grasses in the sward. In this matter of stocking it would be well to bear in mind that in the North Island of New Zealand with some of the finest dairing pastures in the world, the dairy farms carry an average of 46 cows per 100 acres.

In the Tailevu district the pastures are dominated by a number of weed species, mainly goat weed(1), tar weed(2), mile-a-minute(3), sedges(4), willow primrose(5) and Prunella spp. Improved drainage would do much to eliminate sedges and willow primrose but control of most of the annual weeds is dependent on management of pastures and stock.

In order to demonstrate the possibility of control of these weeds by the use of selective weedicides and the spelling of pasture, the Department of Agriculture sought the co-operation of Mr. C. J. Storck of Tailevu, who fenced off an area of two acres of the most heavily weed infested pasture, the weeds present being goat weed, tar weed, mile-a-minute and sedges. On one half of the area the herbage consisted of 50 per cent weeds and 50 per cent grass, mainly sour grass(6) the other half carried 95 per cent weeds, and 5 per cent grass.

On 19th August, 1947, Plot No. 1 of 1 acre was sprayed with Weedone (subdivisional treatments are immaterial to the present discussion).

Plot No. 2 of 1 acre was hand cut by farm labour, no mower being available at the time.

By 22nd September, practically all mature weed growth on Plot No. 1 (sprayed) was dead.

Plot No. 2 (mown) was practically bare ground with a few small patches of sour grass and isolated plants of crowfoot(7). Rain at this time soon induced a dense growth of seedling weeds and all bare ground became covered with a thick carpet of young weed growth while at the same time the grass was making vigorous growth and the small patches enlarging rapidly.

On 6th October, when the seedling weed growth was one or two inches high the whole two acres was sprayed with 1 per cent Weedone.

By 29th October, there was an almost complete kill of all weed seedlings, sour grass was rapidly covering the bare ground in association with some crowfoot and barnyard grass(8). At the end of December grass growth was over one foot in height, all bare ground was covered and the small amount of weed growth which had survived spraying had been smothered.

At this stage the area should have been mown to thicken the turf, prevent seeding of the grasses, and stimulate leafy growth, but with no mower available, grazing had to be restored to, and during January 1948, the area of two acres was twice grazed by 90 cows. Later a mower was procured and on 2nd February the whole area was mown except for a strip at one end where conditions were too rough for the small motor mower.

---

(1) *Ageratum conyzoides.*
(2) *Cuphea carthagenensis.*
(3) *Mikania micrantha.*
(4) *Cyperus* spp.
(5) *Jussiæa* spp.
(6) *Paspalum conjugatum.*
(7) *Eleusine indica.*
(8) *Echinochloa colonum.*

Two weeks after mowing the area was again ready for grazing in an improved condition carrying a dense, leafy growth of young grass occupying practically 100 per cent of the ground with a trace of weeds and sensitive plant. The herbage by temperate zone standards would probably be considered inferior. It is, however, natural to the district, and in the young stage produced reasonable feed before it was obliterated by encroaching weeds. The association with such grasses of Desmodium, a small creeping legume known to some as trefoil, which flourishes on sweet, well-drained soils in parts of Fiji, gives every indication of providing a close well-knit turf, which under good management would be resistant to weed growth, stand up well to frequent grazings and provide a better balanced feed than the grasses alone, " but that is another story ".

From the date of mowing, 2nd February, to the end of March, the two acres of demonstration area were grazed three times at about twenty day intervals by 90 cows, providing on each occasion an ample day's grazing for the herd. The aim was to put into practice the well established principle of allowing growth to attain a height of six to eight inches, then to feed off as quickly as possible by a heavy concentration of stock, followed by rest periods, of length varying with the season, for re-growth.

Essentially the demonstration proves that controls of the annual weeds plus closing to stock for four to five months will completely renovate the worst weed-infested pasture. Provided the weeds are eliminated the methods employed may vary, cost being the determining factor but it appears that the cost of killing weeds by spraying alone is too high. Two crops of weeds have to be dealt with, the standing mature crop and subsequent crop of seedlings which appear before the grasses have time to cover the bare ground. On the demonstration area the results were achieved on Plot 1 by spraying twice and on Plot 2 by mowing (in this case hand cutting) once and spraying once. Comparative costs of the two methods would be as follows:—

1. Spraying twice:			
6 pts. Weedone per acre, 2 operations	£3	0	0
Cost of application, 5s. per acre 2 operations	0	10	0
Cost per acre	£3	10	0
2. One mowing and one spraying:			
Mowing and removal of weed growth	0	7	6
Weedone, 6 pts. per acre	1	10	0
Cost of application	0	5	0
Cost per acre	£2	2	6

The mowing of the whole area on 2nd February was not a weed control measure, but intended to bring under control pasture which had got beyond the capacity of the dairy herd to deal with efficiently.

It is obvious that the cost of pasture renovation by the elimination of weeds and the closing to stock for a period could be considerably reduced if one or several mowings were substituted for the application of weedicides. Another demonstration has therefore been arranged to assess the value of mowing alone for this purpose.

PRODUCE EXPORTED FROM FIJI

FROM APRIL 1ST TO JUNE 30TH, 1948

Bananas	1,985,402	lb	£14,799	Arrowroot	650	„	20
Citrus fruits	66,720	„	836	Copra	5,498	tons	256,696
Mixed fruit	13,020	„	163	Coconut oil	2,714	„	220,375
Peanuts	119,000	„	3,960	Coconut meal	1,215	„	14,233
Ginger	67,650	„	1,128				
Rice bran	342,540	„	1,854				£514,113
Mixed vegetables	6,309	„	49				

RICE VARIETIES GROWN BY CANE FARMERS 1947/1948

By courtesy of the Chief Manager in Fiji, Colonial Sugar Refining Company Limited, the following records of areas and varieties of rice planted by canegrowers during the season 1947/48 have been made available. They show a total increase of 37 per cent over the previous year.

TABLE I—RICE VARIETIES GROWN BY CANEGROWERS, (1947/1948).

Variety.	Area cultivated in each district.					Total area of each variety.		Increase.	Decrease.
	Nausori.	Penang.	Rarawai.	Lautoka.	Labasa.	1947/48.	1946/47.		
Motka (= table = China = Round) ..	26	397	2,675	2,116	257	4,471	3,477	994	....
China Patna (= Lakarawa = English) ..	635	347	1,233	414	....	2,629	2,727	....	98
Bandala (= Lautoka = Latki)	....	50	78	1,729	486	2,343	1,256	1,087	....
Ramcajara (= Jara) ..	1,527	....	....	....	178	1,705	1,115	590	....
New Guinea	151	2	11	89	1,211	1,464	648	816	....
Patna	84	....	....	385	311	780	485	295	....
Sereya Patna	53	....	252	281	55	641	373	268	....
Karia Patna (= Black Patna)	....	....	556	48	177	781	326	455	....
Sonacalif	....	....	....	4	129	133	306	....	173
Chetna (= Gazi) ..	....	....	301	67	....	368	269	99	....
Motmuria	....	....	240	....	24	264	248	16	....
Gerhou (=? Jadhan) ..	....	....	....	....	28	28	153	....	125
Basmatia (= Patalka) .	102	....	....	35	....	137	138	....	1
B.G. 75 (= Dihula) ..	1	....	98	....	....	99	125	....	26
Ramborg	....	....	....	7	....	7	6	1	....
Minoya	5	1	....	125	....	131	9	122	....
Motki	....	....	167	....	....	167	42	125	....
Miscellaneous (not specified)	6	8	....	13	16	43	82	....	39
Total (acres). ..	2,590	805	4,611	5,313	2,872	16,191	11,785	4,406	....
Percentage of total area	16	5	29	33	17	100	....	37	....

Comparison with the previous year's figures which were published in this Journal[1] brings out the following points of interest. Of the 18 varieties grown, five (Motka, China Patna, Bandala, Ramcajara and New Guinea) are of the greatest importance, accounting for over 75 per cent of the total area cultivated by cane-farmers throughout the Colony. The popularity of these varieties is of the same order as in the previous year, although there was actually a decrease of 98 acres in the area planted to China Patna. Important increases are to be noted in the case of the varieties Ramcajara (53 per cent), New Guinea (126 per cent), Bandala (86 per cent) and Motka (28 per cent). The varieties New Guinea and Ramcajara have made marked advances in the Nausori and Labasa districts where Motka has steadily lost popularity in recent years. Of the varieties recorded in the Nausori district, Ramcajara is by far the most important occupying 74 per cent of the total area devoted to rice, with China Patna (24 per cent) as the next most important. For the first time the former variety is recorded in the Labasa district where New Guinea is the most important variety to be found on land farmed by cane growers.

The methods of planting employed are shown on the following table:—

Method.	Nausori.	Penang.	Rarawai.	Lautoka.	Labasa.	Total.
Transplanted . .	2,590	257	1,259	1,353	1,041	6,500
Broadcast	....	406	2,766	3,151	1,615	7,938
Drilled	....	142	586	809	216	1,753
	2,590	805	4,611	5,313	2,872	16,191

REFERENCE.

(1) 1947—Agricultural Notes—1, Rice Varieties grown by canegrowers, 1946/47—*Agric. Jour.* Vol. 18, No. 2, p. 47.

B.E.V.P.

THE POTATO IN FIJI

Time of Planting.—In Fiji the time of planting is influenced by the wet season in that planting cannot be commenced until the wet season is over. Plantings therefore should not be made before June, and, in the western areas no later than August, otherwise a late planted spring crop will suffer severely from the usually dry early summer.

Soils.—A friable, well drained alluvial loam is ideal. Poorer sandy soil will produce good crops provided a green crop is ploughed under, and a rotation of crops put into effect such as —potatoes, green crop, grain crop, potatoes.

Again, poorer soils can be greatly improved by the addition of farm-yard manure. Clay soil or badly drained water logged soils should be avoided. All soils will benefit from the application of 1½ cwt. of super-phosphate per acre.

Preparation of Soil.—The thorough preparation of the soil determines in the main part the resulting yield. Early thorough preparation is essential, and by planting time the soil must be of good tilth. The first early ploughing should be about nine inches deep so that the seed, when planted, will have about 4 inches of worked soil beneath it. After this ploughing the land is left to mellow, but all weed growth is destroyed by the use of a spring tooth cultivator or harrows. If the usual practice of ploughing the seed is not adopted, the land should receive a second ploughing, which should be 3 inches shallower than the first, just prior to planting.

Varieties.—(As imported by Agents) "Factor" would probably be a good variety. It is essential to have certified seed as planting material. Certified seed is seed selected from healthy plants which have produced a reasonable number of tubers of good marketable size. Home selected seed generally consists of the small unmarketable potatoes left over, and more often than not come from diseased or weak-strained plants.

For information regarding the requirements of the Fiji Plant Health Regulations in respect of the importation of seed potatoes, readers are referred to the note on this subject published in this Journal last year(1).

The two main varieties grown under similar climatic condition in North Queensland are namely, "Brownell" and "Bismark". They are considered to be well suited to the conditions and have shown a marked resistence to disease.

The variety "Katahdin" is a late maturing variety resistant to mosaic disease, and is showing great promise under North Queensland conditions.

Seed Preparation.—Large seed potatoes with numerous sturdy eyes may be cut length ways and so made into two "sets". Outside seed potatoes can be made into three "sets" by cutting the potato about ⅓ of its length from the stem end, and then cutting the remainder in two, length ways. Any potatoes which are not perfectly sound or which show a discolouration on cutting,

should be rejected. All cut surfaces should be dusted with wood ashes and spread out in the shade to dry for one or two days before planting. Large seed potatoes are, in many ways, a good indication of the type of crop to be produced, and unless they are very large, it is better to plant them as they are. This prevents rots setting in.

The most recent treatment for protecting the surfaces of cut tubers from Rhizoctonia (rot) infection and possibly from " Scab ", consists of dipping the cut tubers in a Zinc Oxide suspension of 5 ozs. Zinc Oxide in 1 gallon of water, and placing the treated tubers or " sets " between *damp* bags for a period of from 24 to 48 hours, before planting in the field. This treatment of cut tubers has given very promising results, and where soils have been deficient in zinc remarkable improvements in crops have also been noted.

From one half to one ton of seed potatoes (depending on size) is required to plant one acre.

Fertilizer.—The best fertilizer results obtained by the Queensland Department of Agriculture to date have been obtained by the application of a mixture of Sulphate of Ammonia and Superphosphate in equal proportions, at the rate of from 4 cwt. to 7 cwt. per acre. The placement of fertilizer has an important bearing on the resultant crop produced. Best results have been obtained where fertilizer has been placed on either side of the drill about two inches from, and slightly below, the level of the seed. This method of fertilizing ensures a loose layer of soil below the seed. Fertilizing should be done at, or shortly after, planting time.

In the case of plough planting, the fertilizer is spread evenly along the bottom of the furrow to be planted.

Planting.—The general practice is to plough seed in, the field being reploughed for that purpose, and the seed planted in every third or fourth furrow. Seed is generally planted 15 inches apart in the furrow, 5 inches deep. Distance between the potato furrows being 30 inches to 3ft. 3ins. Seed should be set on the side of the furrow to prevent horses tramping on it. Immediately after planting the land should be harrowed. For areas up to one acre, an ideal method of management is to thoroughly work the soil to a good fine tilth, mark out rows 3 feet apart with a home made drag marker, and then plant " whole " seed by hand. This is done by using a short handle in an ordinary sharp chip hoe. The distance " 15-18 " is judged, the hoe buried in for the width of the blade, the soil slightly drawn to the operator so that the seed will go to the bottom of the hole, and the hole then covered by jamming the heel of the boot on to the spot where the potato was inserted.

AFTER PLANTING, HARROW THE SOIL.

Planting.—Another method of planting is to open up furrows by means of a drill, plough required distance apart spacing the tubers by hand as in plough planting, and then covering by splitting the interspace between the drills. This leaves the potatoes in ridges, with ample drainage assured, should heavy rain fall.

Cultivation.—The first cultivation is only carried out just as the potatoes are " breaking ground ". This is done by lightly harrowing the soil. This will not only break any crust on the soil but also destroy any germinated weed growth. All other inter row cultivations are for the purpose of keeping the soil loose and friable and to keep weed growth in check. Care should be taken not to damage the plant roots when carrying out these operations. Several hand chippings between the plants will also be necessary. When the plants are about half grown a half hilling should be given. This can be done with a " duck foot " on a horse scarifier or, on a small area, by dragging the soil from the centre of the rows towards the plants on either side. When the plants come into flower a full hilling is necessary. This is generally done with a potato moulder on a scarifier, or with wings screwed on to a " duck foot ". With a small area, full hilling can be done with a chip hoe. This operation is most important in the tropics as unhilled potatoes will expose the tubers to the direct sunlight and scalding will result. Scalded potatoes turn green and are useless for table purposes.

Harvesting.—With homegrown potatoes, start harvesting as soon as the tubers around a plant are of reasonable size; continue to use in this manner until the crop is mature, then dig with a garden fork. A crop is fit to dig when the skin of the potato is firm and will not " skin off " when lightly rubbed. A crop is certainly mature when the tops start to die down.

When digging, work backwards between two rows, digging in the two rows at a time. After digging, the potatoes should be left for a short time (no more than 1 hour in the tropics) and bagged.

To keep potatoes from rotting, spread on shallow racks in a well ventilated room or, if keeping in bags, turn out the bags from time to time and remove all decaying potatoes.

PESTS AND DISEASES.

Leaf Eaters.—If insects damage the leaves, spray at weekly intervals with—

arsenate of lead	1 lb.
water	50 gal.
hydrated lime	1 lb
or, Kryocide	1 lb
water	20 gal.

Cutworms.—Are big brown soft grubs which feed at night around the stems. Bait the rows with a mash made up of:—

Rice bran	25 lb
Paris green	1 lb
Molasses	1 qt.
Water.	2 gal.

NOTE.—50 lb of mash will cover an acre. Do not spread the bait until just before night-fall. The bait should be made into small pellets and laid along the rows near the plants (not on the leaves) or trickled between the fingers in thin lines.

Blue Mould.—Spray with " Cuprox " at the rate of 2 lb to 40 gallons once a week or, with Bordeaux spray once a week.

Wilt.—If only a few plants wilt down, dig these out and burn.

REFERENCE.

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—C.E.W.

COCOA

A report has been published by H.M. Stationery Office as Colonial Paper 230, giving an account of investigations by Dr. E. E. Cheesman, Ph.D., A.R.C.S.,(former Professor of Botany at the Imperial College of Tropical Agriculture and now of the East Malling Research Station) on the prospects of cocoa growing in Malaya, Sarawak and North Borneo.

Apart from Dr. Chessman's account of the potentialities of these countries for cocoa production, it is of interest to have his opinion that " the present world shortage of cocoa is expected to persist for some time and may increase ".

" Although the bulk of the world's cocoa is in fact grown by small planters, there is no doubt that the crop lends itself perfectly well to estate cultivation, and if it is established as a new crop in Malaya, the capital resources of the companies are likely to make for speedier progress than would be possible if it were entirely a small holders concern ".

" The estate companies in Malaya are all definitely interested in cocoa as a possible adjunct to rubber, wishing to diversify their interests as some insurance against the risks of dependence on single markets ".

Dr. Cheesman urges experiments on clear-felled land with bananas and other suitable plants for ground shade. " The banana can be regarded as a good indicator plan for the success of cocoa. If the planter finds that he cannot establish good, healthy stands of banana plants to protect his young cocoa, he may as well save himself the expense of planting cocoa ".

Professor Shephard recommended cocoa as an additional crop for Fiji. Arrangements have been in train for some time for the introduction of vigorous and high yielding varieties selected in Trinidad but owing to the necessity for guarding against the introduction of the disease, the material has to be quarantined at Kew and it will be some time before it reaches Fiji. In the meantime at least one farmer has become interested in cocoa and is contemplating the establishment of a small area with seed from Samoa. —C.H.

ANIMAL HUSBANDRY . . .

THE ADVERSE EFFECT OF COOL WEATHER ON MILK PRODUCTION IN THE TROPICS

BY R. N. SANDERS, B.V.Sc.

" The following article demonstrates that over a period of two years minimum temperature appears to depress milk production in Fiji to a greater extent than lack of rain. As a preliminary study it cannot be concluded that the great seasonal fluctuation of milk production is solely brought about by minimum temperature though qualitatively there is a general similarity between the temperature curve and the milk production curve. The relationship, however, may not be sufficiently close to warrant the conclusion that milk production in Fiji is a function of temperature. There is a drop off due to climate the effect of which can only be determined by well planned studies both botanically and chemically. These are not available for the period dealt with by the author, whose observations and conclusions are published as in his own words " the beginning of the solution of the main problem in local production ". —W.J.B.

INTRODUCTION.

Milk production in the tropics is normally low and this is frequently associated with a low protein intake. Additionally, cattle indigenous to the tropics have not had the degree of selection for production that the improved temperate zone dairy breeds have had. Attempts to grade up indigenous cattle with improved imported breeds have for the main part, been unsuccessful: (Hammond[2], Kelly[3], Nichols[4]). Rhoad[5] and Edwards[1] have shown that this failure is due to the inability of temperate zone cattle to withstand the high tropical temperatures.

While many dairy cattle in Fiji have an admixture of Zebu blood, the milk and butterfat of organised dairying is produced by predominately European type of cattle. As may be expected, production is low. The demand for milk and its products is greater than the supply. Additionally, faced with increased costs, dairy farmers express their inability to obtain sufficient margin for there to be any incentive for them to remain in business. Studies were therefore initiated in an endeavour to see whether or not it was possible to make production more efficient, thus giving the producer a better return without increased cost to the consumer.

Associated with low general production in Fiji there is a great seasonal fluctuation. This seasonal fluctuation amounted to a drop of 1·1 gallons per cow per day or 52·4 per cent of the peak average of 2·1 gallons during 1946 at the Sigatoka Experiment Station. Similar figures for 1947 show a drop of 1·2 gallons per cow per day or 48 per cent from a peak of 2·5 gallons. Such a seasonal loss is a serious one and may mean the difference between profit or loss to the farmer. This drop in production occurs during the dry season and some farmers consider the dry weather is responsible. All farmers are agreed that they need better fodders during this time of the year but before this can be supplied it must be known for what quality one is looking in any new fodder. Consequently, this series of studies were started in order to determine what was the exact cause of this drop in production. This, the first of the series, was to find what basic factor had the greatest significance as far as the cow was concerned.

DATA AND DISCUSSION.

The data was collected during 1947 and 1946 at the Sigatoka Experiment Station. The cows used were all Friesians and the average number of milkers per month was 10 in 1946 and 12 during 1947. The pasture was all para grass with a predominance of guinea and *Dicanthium* species in two fields. All the fields were approximately one acre in extent and the cattle were rotated regularly. During dry spells young elephant grass was hand-fed. Approximately 3 pounds coconut meal and one half pound molasses was fed to each milker

daily throughout the period. There was an extension of available pasture during 1947. This included four acres of elephant grass. This made possible a more perfect system of rotational grazing. During the dry spells of 1947 Kavirondo sorghum was hand-fed. The feeding for 1947 may therefore be considered to have been better than that for 1946. Daily milk production during 1947 was 0·4 gallons per cow above that for 1946. Table I illustrates the daily average production per cow for each month during the period.

TABLE I.

Month.	1946 Average Production per cow per day.	1947 Average Production per cow per day.	Month.	1946 Average Production per cow per day.	1947 Average Production per cow per day.
	gal.	gal.		gal.	gal.
January	1·5	2·1	August	1·2	1·5
February	1·3	2·3	September	1·4	1·8
March	1·3	2·2	October	1·8	1·9
April	1·2	1·5	November	1·9	2·0
May	1·0	1·3	December	2·1	2·5
June	1·1	1·3	Average for year ..	1·4	1·8
July	1·0	1·5			

The wet season lasts from late November to April and the dry season from May to October. Exceptionally wet or dry weather must affect production. Some claim that the dry weather is the greatest of their problems. However, it may be seen from Figure I that there is an actual rise in production during the driest months of the year. The drop in production during February 1946 and March 1947 could be attributed to exceptionally heavy rain. Such an explanation does not account for the maintenance of production during the heavier rain of March, 1946 or even the rise in production in December, 1947.

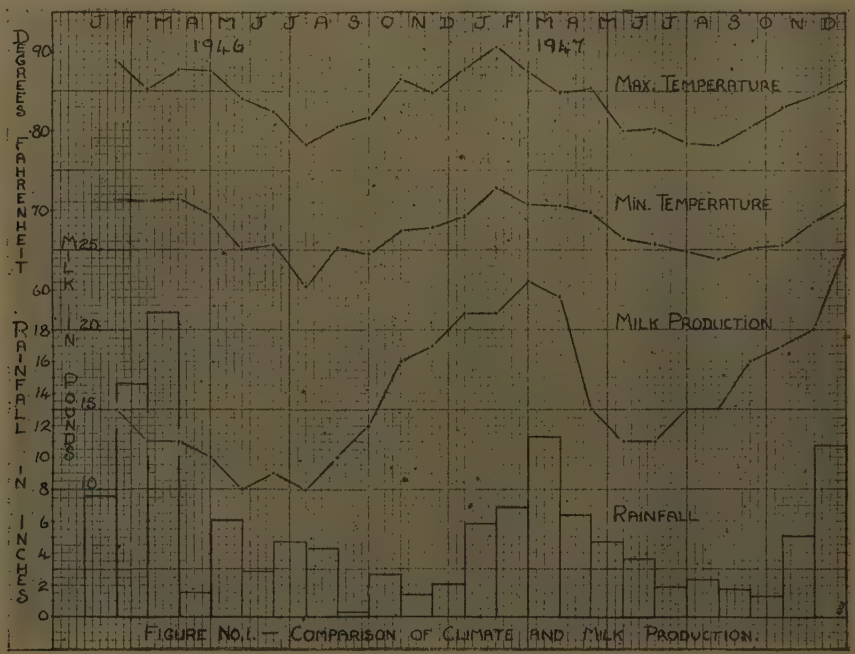

FIGURE No. I. — COMPARISON OF CLIMATE AND MILK PRODUCTION.

It can be seen from Figure I that the milk production curve runs parallel with that of the minimum temperature. Since the minimum temperatures of 1947 were higher than those for 1946, this, rather than improved feeding, accounts for the rise of 0·4 gallons per cow per day during 1947. While it is appreciated that cold weather will depress milk production, the weather at the station could not be considered cold. Meteorological records for a period of 20 years show that it is only on rare occasions that the temperature drops as low as 50 degrees Fahrenheit. Frost is unknown. The minimum temperature in Fiji could not be expected to have any direct effect on the cow. The co-relation of average daily milk production and minimum temperature shows little of significance, though instances, as illustrated in Table 2, do occur occasionally.

TABLE 2.—AVERAGE MILK PRODUCTION AND MINIMUM TEMPERATURE DURING APRIL, 1947.

Date.	Av. Milk/ Cow. lb	Min. Temp.
12	16·0	70
13	15·4	71
14	16·0	74
15	16·0	72
16	14·7	65
17	14·4	62
18	14·7	63
19	14·9	65
20	14·8	69
21	14·3	71
22	15·0	68
23	14·8	68
24	13·1	67
25	14·8	71
26	15·0	73
27	15·7	72

The only rain to fall during the period in Table 2, was 0·09 inches on the 25th. This rain was too slight to be considered as having any affect on either the pasture or the cattle.

CONCLUSIONS.

The minimum temperature, though very mild, affects milk production to a greater extent than lack of normal rain in Fiji. From the literature quoted above, this effect would be expected to raise rather than lower production of temperate zone types of cattle. It is considered that this greatly lowered production is brought about by indirect rather than direct effect of the minimum temperature on the cow. This indirect effect must be the inability of the pasture, mostly para, to stand up during the cooler months. The solution of the 52 per cent drop in production lies not in finding a pasture that does well during the dry periods but one that will not be affected by minimum temperatures between 50 and 70 degrees Fahrenheit.

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MR. G. B. SHAW ON FARMERS

Mr. Bernard Shaw when taking part in a newspaper discussion in a letter to *The Times*, dated April 28th, 1947, had some pungent remarks to make on co-operation amongst farmers.

"The difficulty is to induce the small man to co-operate. It is easy to convince him that he should hire his harvester instead of buying one all to himself; but if you ask him to dig the irrigation channel by which his neighbours will benefit as well as himself he is apt to see them farther first . . . His income tax accountancy, essential statistically, is, for scientific purposes, pure fiction. His agricultural chemistry goes no farther than an abuse of fertilisers and an utter indifference to erosion. National co-operation is possible for him only when it is nationally organised for him . . . Of all politicians and reformers, those whom I find the greatest nuisances are the boys of the everything-or-nothing-all-at-once brigade".

CHEMISTRY NOTES . . .

SOIL SCIENCE IN FIJI—PART IV (CONTINUED)

SOIL SURVEY—ITS ROLE IN LAND CLASSIFICATION FOR LAND-USE PLANNING

BY L. E. SMYTHE, M.Sc., A.R.I.C., A.A.C.I.

In 1943, at Hot Springs, Virginia, U.S.A., the United Nations Conference on food and Agriculture made certain recommendations regarding the long-term organization of agriculture which may be taken to reflect the common aspirations of land-use planners everywhere[1]. The Conference's recommendations are of interest in connexion with future plans for land-use in Fiji and are as follows:—

(*a*) that the inherent natural and economic advantages of any area should determine the farming systems adopted and the commodities produced in that area;

(*b*) that farming systems should be so designed as—

(i) to maintain soil fertility at levels which will sustain yields and ensure adequate return for labour;

(ii) to protect crops and livestock from major pests and diseases;

(iii) to favour steady employment throughout the year;

these three ends, in general and save in exceptional circumstances, can best be assured by balanced mixed rotational farming and by avoidance of single crop production, or monoculture;

(*c*) that production of nutritionally desirable foods which can be obtained from elsewhere only with difficulty or not at all is a special obligation of the agriculture of every country;

(*d*) that in every region subject to drought (occasional or in the form of sharply marked periodic dry seasons) suitable measures should be undertaken, partly by storage and partly by diversification of production and development of water resources and cultural practices;

(*e*) that land used or likely to be required for agriculture should be protected from erosion;

(*f*) that the spread of existing knowledge by education and the development of new knowledge by research should be constantly promoted, and that in these matters nations can co-operate to great advantage.

It is interesting to note that every objective in the above list requires, directly or indirectly, the maintenance of soil fertility. In the first three parts of this series of articles, plans for a reconnaissance soil survey of Fiji have been outlined and the methods of examining soils in the field and in the laboratory have been briefly surveyed. The questions which now naturally arise are:—

(*a*) what is the role of soil survey in land classification for land-use planning?

(*b*) how may the reconnaissance soil survey of Fiji be planned so as to fit in with trends in social and economic factors?

An attempt will be made to answer these questions in this article.

Land classification for land-use planning is essentially—"the grouping of lands according to their suitability for producing plants of economic importance[2]".

Land classification for land-use planning is based upon:—

(*a*) soil fertility characteristics and

(*b*) on whatever characteristics of the land are significant to the specific objective of the plan.

Fiji is not a highly developed country and consequently the social factor has not operated appreciably. This fact is of the utmost importance when considering the highly detailed "soil survey land-type inventories" of the more developed countries; such, with greater emphasis on social-economic conditions. In Fiji therefore a physico-chemical land classification is applicable without great modification to land-use planning. The prime requirement of land-use planning in Fiji is to avoid any costly trial-and-error process of crop adaption. Instead of planting a crop on inferior land because it is near a roading, in comparatively undeveloped countries, the idea is to bring the road to the most suitable land. We would lose the whole significance of land-use planning if we did not realise that the social-economic factor is responsible for the highly detailed land classification of long-settled countries.

The trend of the United States of America and other well-developed countries, tends to change the soil survey into a land inventory. In the words of Moon[3] to "charge the soil type with the maximum load of land-use meaning". Therefore, if we are to make the fullest use of information arising from the reconnaissance soil survey of Fiji, such survey must be so planned as to strike the balance between the physico-chemical classification of the soil and the land inventory. Indeed with the information collected in the course of the present reconnaissance soil survey it should not be difficult to provide a solid foundation for future land-use planning (see Part II of this series).

Milne[4], perhaps one of the greatest authorities on tropical land classification, describes the soil surveyor's approach to land classification as follows:—

> "The soil surveyor regards himself as a student of the land who, being a soil scientist first, distinguishes his land types primarily by soil profile . . . his own first duty as a key man in the rationalization of rural production, is the expert recognition of the varieties of soil profile that exist in his piece of country and their reduction to a manageable number of series and types. As he goes about in the field plotting soil type occurrences, he must, however, bear in mind that he will have the further duty of making clear, for all who follow him on land questions, what the significance of his data is. He must, therefore, pay attention to a good deal besides soil profile".

The soil survey then pays attention to internal and external soil characteristics. The internal characteristics might include physical, chemical and biological properties and the external characteristics: climatic conditions, drainage, topography, erosion, stoniness and so on.

With regard to the soil survey report, in the words of Kellogg[5]:—

> "The soil survey report which accompanies the soil map describes the area surveyed, the characteristics and capabilities for use of the soil types and phases shown on the map, and the principal factors responsible for soil development. It is an integral part of the complete publication and not simply an adjunct to the map. Except as a base map, the soil map without the report is of little use to persons unfamiliar with the specific nomenclature employed. First of all, the report contains a complete description of the soil types shown on the map and their relationship to one another. As the objective of the work is to provide information directly relating to the agricultural use of the land, those characteristics of importance in the use of the soil for the growth of plants are stressed".
>
> "Much of this information is obtained by observation during the course of the survey, but by no means exclusively so. Climatic, chemical, economic, agronomic, and all other data bearing on the nature and capabilities of the soil from other sources are used to the extent that such information is available and can be interpreted in relation to the soil types occuring in the area. To the extent that the location of the soil areas in respect to markets and similar factors have

an important bearing on the use of the soils, these relationships are identified and discussed ".

The more detailed the soil survey, the greater is its adaptability in countries where the social-economic factor is predominant. Highly detailed soil survey will at present be confined to limited areas in Fiji and the overall framework provided by the reconnaissance soil survey will be gradually filled in. Land usage trends and the social economic factor are continually and gradually changing and any soil survey work must be adaptable.

In 1938 Moon([3]) listed ten maps which could be plotted from the Tennessee Valley soil survey maps. These are:—

(1) a general productivity map;
(2) a potential land-use map;
(3) a lay-of-the-land map;
(4) a general erosion map (either of conditions resulting from past erosion or of natural susceptability to future erosion);
(5) a map of stoniness;
(6) a natural zoning map;
(7) a relative evaluation map;
(8) a detailed natural drainage map;
(9) a crop adaption map;
(10) a land management map.

The range of such maps may be extended to include soil fertilizer requirement maps and so on. The systems of land classification developed in Australia and New Zealand are by no means novel to these particular countries. For example, it was not until 1944, that Grange([6]) in New Zealand put forward his system of land classification based on inherent productivity, in turn, based on soil survey. The earliest and foremost developments in land classification for land-use planning took place in the United States of America, Great Britain, Germany and Russia. Other countries such as the Netherlands East Indies, Australia, South Africa, New Zealand and Canada have developed systems which are, essentially, all based on the same fundamental principles arising from research in the older countries.

There are many very successful land-use planning schemes and there are also some complete failures. An inquiry into the reasons for the failure of some land-use planning schemes is very illuminating. In the words of Jacks(j): " Firstly a land-use plan is dynamic; it changes as is unfolds. We can see the goal—the highest attainable level of fertility—but we are lucky if we can see more than one step forward at a time. Secondly, that the people must play as intimate a part in the execution of the plan as the crops and animals they tend. This is a political matter; a people controlled by an autrocrat is a more pliant agent in executing a plan than a nation of individualists. Thirdly, that the present state of society should determine the next step forward. Here again, an autocracy can take greater liberties than a democracy, but whatever the policy an appreciation of the facts of human ecology is essential ".

In 1943, Gross([7]) wrote of the failure of a land-palnning programme launched in certain areas of the United States of America in 1938. He stressed that the failure could be attributed .. . . " To the fact that no desire to solve community and country problems was created in the population of the areas in which the planning programmes were to function. Experts can work out beautiful expositions of problems. They can present exclusively alternate solutions, but unless a self-interest to achieve these results is established, the expert has little or no value ".

The future of agriculture in Fiji, and with it any scheme of land classification for land-use planning will depend upon the recognition that even though social and economic factors do not enter directly into the land classification itself, they *do* enter into the effectuation of the plan. The need is clear. Agricultural and silvicultural production must be expanded and to achieve such expansion the best use must be made of our good lands; roads to such good lands must have first priority; soil conservation practices must be extended and enforced and the use of the land must be planned. Only when we can pay for the greater portion of consumer goods by primary pro-

duction; only when our food products contain the highest nutritive value obtained from correctly managed soils, and soils free from deficiencies of the major elements, can we greatly improve the standard of living and health of the community. Any other scheme for the well being and health of the community will not readily achieve its aim unless attention is paid to such facts.

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FUMIGATION DAMAGE TO PINEAPPLES

During November, 1947, two shipments of fresh pineapples to New Zealand ports arrived in an unsatisfactory condition. Owing to a temporary breakdown of the fumigation equipment at Suva, it had been necessary to change over from the normal fumigant (HCN) to carbon bisulphide. The first reports received from New Zealand were to the effect that the fruit had been rejected as a result of an attack of the fungus *Thielaviopsis paradoxa* or ' soft rot '. Damage was later ascribed also to fumigation, but no assessment was given of the relative amount of damage caused by the two conditions.

Examinations made in Fiji showed quite definitely that a considerable number of the fruit was attacked by the fungus *Thielaviopsis paradoxa*; but at the same time, and particularly with the Queen variety of pines, a new condition was found in fruit treated with carbon bisulphide fumigant. Experiments arranged by officers of the Department of Agriculture proved quite conclusively that damage, mainly to Queen pines, was caused by the carbon bisulphide fumigant, although *Thielaviopsis paradoxa* damage was also marked in both varieties.

In carefully controlled experiments various concentrations of the gas were used on pineapples of varying maturity and condition. These all demonstrated that a small proportion of the Ripleys and a much larger proportion of the Queens were heavily damaged by the Carbon bisulphide fumigant. The matter was taken up with the Director, Plant Diseases Division, of the New Zealand Department of Scientific and Industrial Research, who confirmed that considerable damage due to fungal rot had been noted; but another condition which he ascribed to fumigation damage had been noted in a small proportion of the Ripleys, and most of the Queens were so affected.

Although cyanide gas was normally used in the case of large shipments the Department had used carbon bisulphide in the past for the fumigation of small consignments without experiencing this trouble. There being no information on record to suggest that carbon bisulphide caused damage to soft fruits, letters and photographs describing the condition were sent to the Directors of Agriculture, Malaya, and the Philippine Islands, to the Director of the Pineapple Research Station, Hawaii, and to the Directors of the Department of Scientific and Industrial Research, New Zealand and Australia. The replies to these inquiries were uniformly of the opinion that although carbon bisulphide was not usually considered to be a normal fumigant of soft fruits, there was no available evidence to suggest that it could cause the damage which had been experienced in Fiji. One reply pointed out that the United States Department of Agriculture had used carbon bisulphide with success as a fumigant for soft fruits. As a result of these inquiries and of past experiences,

suspicion was cast on the quality of the carbon bisulphide used in fumigation. Samples were examined by the Chemical Division of the Department and were shown to contain certain impurities such as sulphuretted hydrogen and other sulphur compounds, in amounts greater than those usually present.

This suggested that impurities in the carbon bisulphide might have been the cause of the damage. Accordingly a sample of pure carbon bisulphide was prepared from the commercial material and this, together with the commercial material, was used experimentally and under similar conditions of fumigation with sample cases of pineapples. The results of this experiment showed that pineapples fumigated with the purified material showed no damage whereas pineapples fumigated with the commercial material developed the typical condition previously noted.

It seems clear therefore, that the main reasons for the breakdown in the fruit were:—

(*a*) the presence of the fungal disease *Thielaviopsis paradoxa*; and

(*b*) fumigation damage due either to an impurity or impurities, contained in the commercial carbon bisulphide used by the Department of Agriculture; or to some condition of the fruit which predisposes it to carbon bisulphide damage.

The matter of the purity of the carbon bisulphide has been taken up with the manufacturers and samples have been submitted to them for examination and report.

—W.J.B.

WILT DISEASE OF GUAVA IN INDIA

In order to investigate a destructive wilt of guavas occurring at Lucknow and in other districts of the United Provinces, trees of the Government Horticultural Garden were kept under careful observation during the years 1945 and 1946. The highest rate of wilting occurred during the rainy season, the disease starting in August (four trees attacked) and increasing sharply in September (15) and October (10) when the most deaths occurred. In November there was a marked decrease in the number of infected trees (six to seven) and with the advancing winter the disease came almost to a standstill. The symptoms are a yellowing and drying of the leaves of terminal branches, the complete wilting of the tree taking 10 to 15 days. Some of the finer roots showed black streaks which became more prominent on removing the bark, while others were uniformly black. Isolations from the root system and the lower part of the diseased trees yielded a *Fusarium* sp. Inoculation tests were made with potted plants one month, three months, one year, and three years old, to the soil of which the *Fusarium* culture was added. The percentages of wilted plants of the different ages were 86·3, 100, 83 and 80 respectively; no wilting occurred in the controls. The fungus was re-isolated from the roots of the wilted plants. Grown in Richard's solution it produces some toxic substance which causes wilt in the guavas. Seedlings transferred to these solutions die readily. In a filtered 20 day old culture solution the first wilt symptom in one year old seedlings was observed after three hours, and within 10 to 12 the plants died. Further studies of the mechanism and physiology of wilt are in progress and a detailed paper is expected to be published shortly.

Das Gupta (S.N.) & Rai (J.N.) Wilt disease of Guava (*Psidium guajava* L). Curr. Sci., XVI 8 pp. 256–258, 2 graphs, 1947.

ECONOMIC BOTANY NOTES . . .

PAPAIN

As the result of an article in the April *Pacific Islands Monthly* some local interest in the cultivation of Papaya and the extraction of Papain has been aroused and several inquiries have been received from local residents.

The following information, taken from the *National Formulary*, 8th Edition, 1946, has been supplied by the Pacific Islands Trading Co., whose offer is contained in the final paragraph of this circular.

" Papain. Papain is the dried and purified latex of the fruit of Carica Papaya Linne (*Fam. Caricaceae*). Papain possesses a digestive activity not less than that of the Reference Papain.

Description—Papain occurs as light brownish grey to weak reddish brown granules or as a yellowish grey to weak yellow powder having a characteristic odor and taste.

Solubility—Papain is partially soluble in water, the solution being more or less opalescent or hazy. It is nearly insoluble in alcohol, in chloroform, and in ether.

Assay—Weigh 2 Gm. of dried beef powder into a suitable wide-mouthed bottle fitted with a rubber stopper. To the bottle add 0·1 Gm. of Papain, accurately weighed, and 50 cc. of water, and shake until thoroughly mixed. In a similar manner prepare another bottle containing 0·1 Gm. of reference papain, 2 Gm. of dried beef powder and 50 cc. of water. Place the bottles in a water bath at 52° and maintain at that temperature for 2 hours, agitating the contents equally every 10 minutes by inverting once. At the end of the digestion period remove the bottles from the bath and pour the contents into measuring vessels similar to those described under Pepsin. Wash each tube with 50 cc. of water and allow the undigested residue to settle two hours. The volume of residue in the vessel corresponding to the Papain is not greater than that contained in the vessel corresponding to the Reference Papain (about 5cc).

Storage—Preserve Papain in tight containers and avoid heat ".

The measuring vessels described under " Pepsin " are as follows:—" 100 cc conically shaped measuring vessels, having diameters not exceeding 1 cm at the bottom and complying in other respects with the water and sediment tube Astm Standard Method, D96-35, graduated from 0 to 0·5 cc in 0·05–co graduations; from 0·5 to 3 cc in 0·1–cc graduations; from 3 to 5 cc in 0·5–cc graduations; from 5 to 10 cc in 1–cc graduations; from 10 to 25 cc in 5–cc graduations; and with graduation marks at 50–, 75– and 100–cc points ".

This firm also states—

" We hope it will be possible to interest planters in making some initial experiments with the object to producing Papain of a suitable grade for this market. Papain of the right grade has been selling recently in New York at prices ranging upwards from $2.75 per pound but we believe it is desirable to figure on a more conservative figure than this as all prices will undoubtedly decline before long. We will furnish actual specific prices upon receipt of samples complying with the National Formulary ".

The *Agricultural Journal of Ceylon*, Vol. XCIII, No. 4, October, 1939, gives the following information.

The latex containing the papain is best obtained from full-grown, or nearly full-grown, well-developed green fruit by making 2 to 4 longitudinal incisions not more than $\frac{1}{8}$ inch deep. This operation may be repeated every three to seven days. It has been found that better yields are obtained if only a few incisions are made at a time, the tapping being done over a longer period until the fruit is covered with incisions approximately 1 cm. apart. The flow is most abundant in the early morning. Very young fruit give a latex that is rather weak in digestive power, while ripe fruits give very little, if any, milky juice.

Only non-metallic containers, such as glass or porcelain dishes, should be used to collect the latex, because the juice acts on the metal and becomes discoloured. Coagulation soon begins and the mass adhering to the surface of the fruit must be carefully scraped off. Considerable time and labour would be saved if a convenient and efficient vessel could be devised which could be quickly put in place to receive the juice, permitting the operator to proceed to the next tree in the meantime.

The juice must be dried promptly after it is collected or decomposition, which destroys the value of the product, will occur. Sun-drying is practised to some extent, but it is much more satisfactory to dry the latex in a properly ventilated oven operated at 50 to 55° C.

One form of drier is about three feet broad, three feet deep and six feet long. The sides and ends are made of brick, and openings are provided at both ends, one for the flue and the other to admit fuel. A foot from the top, which is open, a sheet of iron is placed, and upon this one or two inches of sand are laid to modify and distribute the heat arising from the fire beneath. The coagulated juice is spread upon brown linen stretched upon frames, which are made to fit the top of the drier. The temperature should not exceed 50 to 55° C., since great heat destroys the ferment. The dry and flaky material can be ground in a coffee-mill, preferably when the material is warm, and it should then be in the form of a light cream-coloured powder, this powder should be placed in bottles, which should be tightly sealed.

Little information is available as to yields. Amounts of papain extracted per plant vary considerably; 20 to 250 grams per tree, or from 60 to 350 lb of dried latex powder per morgen may be produced. Coagulated latex produces 25 per cent of its weight of dried powder. The latex is harvested through three seasons. By the fourth season the fruit is so high on the trunk that the cost of collecting the juice becomes prohibitive.

Recent advice from H.M. Government Agents in Australia states that this product was, until April of this year, realizing approximately 25s. per pound f.o.b. Australian currency, but that since then the market price has steadily decreased until June when it touched 14s. 6d. per pound for first grade. There is now a slight improvement in price.

—B.E.V.P.

NOXIOUS WEED OR VALUABLE FIBRE?

In a recent article by Kirby(1) dealing with the possibility of the production of jute and its substitutes in the Colonial Empire, there appears an interesting reference to *Urena lobata*, known in Fiji as "qatima" or Hibiscus burr and considered to be a noxious weed.

This plant has been cultivated as a fibre plant in a number of countries, particularly in the Belgian Congo where in 1943 production was about 13,000 tons of fibre. The crop has also been encouraged in Brazil and before the war a factory in Madagascar was making bags—the total production of fibre being 3,000 tons. In the latter country natural stands, such as occur in Fiji, are mainly used and by law cutting of plants between 1st January and 31st May is forbidden in order to conserve supplies.

It is further stated that "of all the fibres which have been suggested as substitutes for jute, it is probable that *Urena lobata* is the most promising: the fibre is fine, soft and lustrous and has good spinning qualities". It can be used for textile purposes, ropes carpets, packing materials, upholstery or in admixture with other materials.

The plant occurs in many parts of the British Empire, but has not been cultivated on a commercial scale. Trials made in British Guiana were not promising but it is being cultivated experimentally in Trinidad where it also occurs in natural stands.

Interesting notes on the cultivation and soil requirements of the plant are quoted from a report published in the Belgian Congo(2). It is stated that the plant will not tolerate acid soils and that it is very exhausting on the soil, so that rotations are necessary if good yields are to be obtained. The fibre is produced by the retting process; the yield of fibre from the green stems being on the average 5 to 6 per cent. Both the publications referred to in the above notes are available to any readers who may be interested.

B.E.V.P.

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(2) Bulletin Agricole du Congo Belge, Vol. 26, 4–40.

BANANA RESEARCH.

The July issue of the *Crown Colonist* reports the completion of arrangements for a scientific mission to go to the Far East in July to collect wild bananas for use in cross-breeding programmes in Jamaica. The mission is to be led by Dr. K. S. Dodds of the Imperial College of Tropical Agriculture, Trinidad.

Dr. Dodds visited Fiji in 1945 together with the late Professor D. D. Paterson to report on the re-organisation and operation of the Department of Agriculture.

Panama disease is fortunately not present in Fiji but leaf spot causes trouble in most years, being responsible for the premature and abnormal ripening of fruit packed for export during the late summer months.

—C.H.

"FUMIGATION WITH CARBON BISULPHIDE"

S.510. *How is carbon bisulphide used as a fumigant?* (*Croydon*).

"Carbon bisulphide can be employed for fumigation in the open and for fumigating rodent burrows in open sheds, hedgerows or fields. A method of using it is to soak a large wad of cotton-wool, rags or similar absorptive material with the liquid and to insert it in one of the burrows with the outlets and inlets sealed. The liquid evaporates, permeates through the burrows and asphyxiates the rodents.

It is also used for fumigating grain against the boll-weevil. For this it can be burnt in a container. However, it is very inflammable, so this must be done carefully.

The use of carbon bisulphide as a fumigant is not advised. Its uses quoted above are really old-fashioned. It is not a safe or pleasant material to use. The explosive range of carbon bisulphide mixtures in air is very wide (about 1–50%). The ignition point is very low, under suitable conditions as low as 100°C. Thus a hot steampipe or an electric light bulb may ignite the vapour. Hence elaborate precautions against fire and explosions are necessary.

There are other modern fumigants far safer and easier to use. DDT can be used as a spray or in burrows. *Ortho-dichlorbenzene* can be used in empty spaces. Sulphur candles can be used. Sulphur dioxide is much safer to handle than carbon bisulphide and it can be used indoors if away from food. Carbon monoxide generated from the exhaust pipe of a car engine is efficacious if passed by a rubber tube into rodent burrows; this gas, of course, is poisonous to human beings and is lighter than air, so that it must be used carefully".

Extract from Manufacturing Chemist, March, 1948, XIX, 3.

ENTOMOLOGY . . .

NEW INSECT PEST RECORDS IN THE BRITISH SOLOMON ISLANDS

BY R. J. A. W. LEVER, B.Sc., D.I.C., A.I.C.T.A., F.L.S.

An article published by the writer in 1943[1] included references to insect pests in the Solomon Islands which had also been dealt with briefly in an earlier publication[2].

During 1945 the writer was able to return to these islands for a short visit and the following list deals with additional economic insects collected there. Most of them have not been recorded prior to the immense crop-growing campaign undertaken during the occupation by the American military and naval forces when thousands of acres of market gardens crops were cultivated for the first time on Guadalcanal and the Russell Islands.

ORTHOPTERA.

Austacris sp.	Rice, maize and tobacco leaves.
Gesonia sanguinolenta Kr. ..	Taro (*Colocasia*) leaves.
Catantops angustifrons Wlk. ..	Lettuce leaves.
Atractomorpha crenulata F. ..	Egg plant (brinjal), sweet potato and radish.
Oxya gavisa L	Rice and lettuce, coconut, sugar cane and maize leaves.

RHYNCHOTA.

Icerya purchasi (Mask.) . ..	*Casuarina equisetifolium* twigs.
Unaspis citri (Comst.)	Citrus fruit.
Aphis maidis Fitch	Maize plant.
Nezara viridula. L.	Tomato, bell pepper, cowpea and maize.
Leptoglossus australis F. . ..	Tomato and pumpkin.
Amblypelta cocophaga China ..	Coconut, cassava and *Barringtonia edulis.* Serious shoot stunting of cassava.
Dysdercus decussatus Boisd., *D. sidae* Montr. and *D. oceanicus Boisd.*	On cotton, kapok and okra.

ISOPTERA.

Microcerotermes biroi Desneux . ..	Carton nests on jungle tree trunks (Fig. 1.).
Eutermes novarum-hebridarum Holmgren	Betel nut (*Areca*) wood.

LEPIDOPTERA.

Sylepta derogata F.	Leaves of *Hibiscus manihot.*
Sesamia sp. near *inferens* Wlk.	Rice stem-borer.
Pyrausta salentialis. Snell ..	Maize stem-borer.
Heliothis armigera Hb.	Maize (leaf, tassel and cob), tomato fruit and tobacco leaf.
Prodenia litura F..	Onion and tomato leaves.
Hymenia fascialis Cram . ..	Beet, pumpkin and spinach leaves.

COLEOPTERA.

Aulacophora abdominalis F. ..	Pumpkin and cucumber leaves.
Aulacophora similis Ol. . ..	Pumpkin, cucumber and sweet potato.
Monolepta semiviolacea Fauv. ..	Cucumber, pumpkins, sweet potato and radish leaves.
Aspidomorpha australasiae Boisd.	Sweet potato and tung oil leaves.
Epilachna 28-punctata F. ..	Tomato, bean and pumpkin leaves.
E. doryca Boisd.	Tomato leaves.

Papuana hübneri Fauv. / *P. inermis* Prell	Taro (*Colocasia*), tubers, rice roots and ground-nut roots.
Cosmopolites sordidus Germ.	Banana corm.
Compsolacon gracilis (Candose)	Ground-nut roots.
Calandra oryzae L.	Stored maize cobs.

Photo by R. J. A. W. LEVER

Fig 1: Microcerotermes birol Desneaux. Carton nests on jungle tree trunk, Russel Island.

DIPTERA.

During the Solomon Islands campaigns of 1942 and 1943 heavy invalidism was caused by malaria conveyed by the Melanesian species of *Anopheles*. Despite a joint paper by three American authors[3] who prefer to regard the mosquito as *A. farauti* Laveran, Australian workers are more cautious and consider it safer to use *A. punctulatus* Don. *farauti* Laveran[4] and here it seems best to leave matters till the synonymy is finally settled. The photograph (Fig. 2) shows a ditch in which a Pandanus is growing among whose roots larvae of this mosquito were collected on Guadalcanal in 1945. Various points were cleared up in a recent article[5].

The buffalo fly, *Lyperosia irritans* de Meij., reached the Solomons in the early 'twenties but its range is increasing. In 1933 it was confined to Guadalcanal, Florida, Tulagi and the Russell Islands[6] but the writer took it on Malaita in 1945 where it was a pest of cattle. Spraying or dusting with DDT or gammexane offers good chances of checking it.

Photo by R. J. A. W. LEVER

Fig 2: Pandanus roots harbouring larvae of mosquito (Anopheles), Guadalcanal.

Readers will find a map of the Solomon Islands in *Tropical Agriculture* for October 1945 (Vol. 22, No. 10).

Figure 3 shows palms along the Matanikau River, Guadalcanal with foothills in the distance and serves as a typical landscape in the Solomon Islands.

GENERAL.

The writer is indebted to the Directors of the Imperial Institute of Entomology, London and of the Hawaiian Sugar Planters' Association of Honolulu for identifications of insects.

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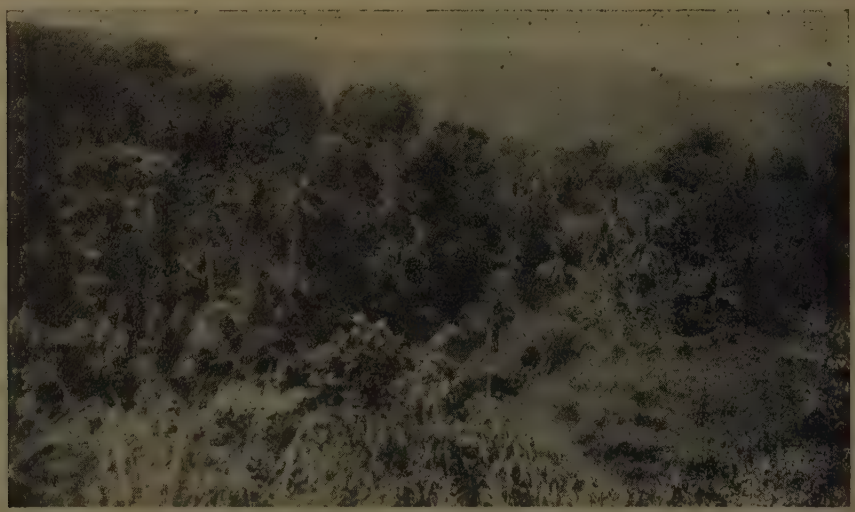

Fig 3: Matanikau River, Guadalcanal.

AGRICULTURAL PRODUCTION IN THE BRITISH COLONIAL EMPIRE

" Productivity of land depends as much upon sound systems of land tenure as upon improvised agricultural practices and any policy of development must increase the range of land matters and social issues to which colonial administrators will have to give urgent attention. It would seem that a solution of the social issues involved must lie in finding a balance between the advantages and disadvantages of the traditions of the past, the customs of the present and the needs of the future. Bold experiments may have to be done.

To the majority of the colonial peoples' agriculture is the foundation of their lives, their well-being and their hopes. With good will and understanding and with proper organization, agricultural production can make great strides forward, but the traditions and customs of the colonial peoples must always be regarded sympathetically and with understanding. If the objective of greater production is made clear, enthusiasm aroused and willing co-operation secured, progress is certain ".

Sir Frank Stockdale in *Nature*, Vol. 61, No. 4088, p. 337.

VETERINARY . . .

COMMON COMPLAINTS OF DOGS IN FIJI
PART 2—WORMS

BY K. J. GARNETT, B.V.Sc.

A very commonly heard statement in Fiji is, "My dog has worms" or "I think he has heartworm". In the majority of cases, this statement is correct, but in many cases, the methods adopted to eradicate these worms are useless and sometimes harmful. To begin with, dogs can be infested with a large number of different internal parasites, which localise in various parts of the dog's body, and for treatment to be successful, a correct diagnosis of the type present is essential, since treatment not only varies with the size, age and condition of the dog, but naturally, is also affected by the type of worm present. For example, treatment for heartworm will have no direct effect on hookworms in the intestine and vice versa. However, it should be remembered that anything that will eliminate one parasite means that the dog has more resistance to combat the other, so that there is an indirect benefit following any effective course of treatment for another parasite.

Broadly speaking, the main types that cause trouble in Fiji are:—

1. Tapeworms.
2. Roundworms.
3. Hookworms.
4. Heartworms.

1. TAPEWORMS.

These are the largest worms found in the dog's body. There are many varieties, but in spite of their spectacular size, *Diphyllbothrium latum* which is mainly found in North America and Northern Europe and may grow to thirty feet or more, their effect on the dog is not nearly as serious as the types to be described later, and no detailed description of tapeworms will be given here.

Tapeworms are to be suspected if the dog eats well and fails to put on condition, and also if small creamy white segments resembling small grains of rice are seen in the droppings of the dog. Diagnosis is confirmed by a Veterinarian picking up the eggs of the worms in a microscopic examination of the droppings.

Treatment with arecoline is highly effective, but this must be prescribed by a Veterinarian.

The drug of choice for cats is kamala. (Note, not the Fijian sweet potato of similar name).

2. ROUNDWORMS.

There are two main types seen in dogs. These are, *Toxacara canis* and *Toxascaris* spp.

Toxascaris will grow to about three or four inches or more while Toxacara may be nearly double this length. Both worms are a creamish white colour and may be nearly as thick as a match.

They both affect their host in many ways. Adult worms which are normally found in the small intestine, feed on the contents and also gnaw at the lining with the result that ulcers are often formed, and the irritation set up will often cause severe diarrhoea which may contain blood. The adult females can lay up to 200,000 eggs per day, and these eggs are passed out with the fæces. Depending on the soil and climatic conditions they encounter, development of the egg to an effective stage occupies a period of from three to eight days. Dogs become infected by eating food from ground on which such eggs have been deposited and pups may also become infected by suckling a mother whose skin has become contaminated by lying on such ground. On reaching the intestine, the eggs hatch and the larvæ burrow into the walls of the gut where some of them may develop. Others wander through to various other organs of the abdominal cavity, and often get into the blood stream which carries them to almost any part of the body. How-

ever, since the blood from these organs usually goes through the lungs first, most of the larvæ are lodged in the lungs where they undergo further development before being coughed up the trachea or windpipe to pass down the oesophagus or gullet into the intestine again. The time taken from the hatching of the eggs in the intestine until they find their way back there again is about seven to 23 days, and a further eight or nine weeks is required for them to become adult worms and to commence laying eggs. It should be noted that in their wanderings, the larvæ may become lodged in the brain, and as a result of the irritation caused there, " fits " may occur.

Drugs at our disposal are fairly effective, but it is important to note that they will only kill the worms which are actually in the intestine and have no effect on those which are wandering around the body in various stages of development. For this reason, dogs should always be retreated about a month later in order to kill the young worms which have by then found their way back into the intestine.

It is of little use treating the dog if the source of infection is to remain, and for this reason it should be noted that the eggs will live for up to a year under suitable conditions of shade and moisture, but will only survive for a few weeks if exposed to sunlight and deposited in light sandy soil. Care should therefore be taken to see that the yard in which the dog runs is cleaned up and that he is fed off a plate rather than off the ground. If he has an outside kennel, this should be shifted periodically and care should be taken that the ground near it should receive direct sunlight for part of the day.

It should be further noted that, in their wandering the larvæ may enter the unborn pups of a pregnant bitch so that pups may actually be born infected with this type of worm. Since the larvæ are usually carried to the fœtal pups in the blood stream of the mother, the usual site for them to be found is in the liver. Bitches in advanced pregnancy are likely to abort if treated, so that every care should be taken to see that the mother has been effectively treated before or shortly after she has been mated.

Adult dogs are more resistant to the worms than young pups, and, although they may appear healthy themselves they constitute a very real danger if a young pup is run in the same yard, since the pup is infected from the eggs deposited by the older dog and has not the resistance to combat the infestation in the same way. For this reason, when it is known that a new pup is to be obtained, older dogs should be checked on, treated if necessary, and the yard cleaned up.

Symptoms seen in pups are that they do not appear to grow well, are thin and often restless and may moan or cry out. The abdomen may be tucked up, but in some cases there is a " pot bellied " appearance. Irritation caused by the worms in the intestine may give rise to severe diarrhœa or conversely, to an intestinal stasis which results in constipation. The coat is usually rough and lacking in lustre. The mucous membrane of the mouth is usually pale instead of the normal pink colour. As previously mentioned, nervous disorders or fits are often seen, particularly in younger pups. Diagnosis is confirmed by a Veterinarian picking up the eggs in a microscopic examination of the fæces.

3. HOOKWORMS.

Two main types are seen, *Ancylostm* of which there are two more common species, *A. caninum* and *A. braziliense*, and *Uncinaria stenocephala*. *A. caninum* is about one half to threequarters of an inch long, while the other two types mentioned are little more than half that size.

Hookworms, like the two previous classes mentioned, are found in the small intestines of dogs and cats. They differ, however, in that they actually attach themselves to the mucous membrane from which they suck blood at a really astounding rate. Naturally, if the infestation is at all heavy, a severe anæmia soon results and this can readily be detected by noticing the extremely pale mucous lining of the mouth. Loss of condition, general weakness and sometimes œdema or dropsy are commonly

observed. Severe diarrhœa which often contains blood is usually seen in more severe cases. The coat is dull and rough, and because one of the modes of entry for the larvæ is to actually bore through the skin, considerable irritation with intermittent scratching is frequently observed.

Here again, the eggs pass out with the fæces, but differ from the roundworms in that the eggs do not need to be again ingested by a dog and then hatch in the intestine. Instead, the eggs hatch out in approximately 20 hours into larvæ which undergo developmental stages in the soil for nearly a week before reaching the infective stage when they can give rise to adult worms if they find their way back into the body of a dog. The time occupied from the entry of the larvæ into the dog until they become adult worms is approximately five weeks. As previously mentioned, there are two modes of entry. The first is through the mouth as with roundworms while in the second, the larvae actually bore through the skin until they reach the blood stream which may carry them to all parts of the body. However, hookworm larvæ soon die if not returned to the small intestine of the dog and do not cause nearly as much trouble in this respect as the far more active roundworm larvœ.

As with the roundworm larvae, the hookworm larvæ can be carried in the blood of the pregnant bitch and set up prenatal infestation in the pups.

Once again, diagnosis is established by microscopic examination of the droppings, but if the symptoms previously described are noted, particularly the pale mucous membrane, the dog should be taken to a clinic for attention. Drugs at our disposal are highly effective, but as with roundworms, it is advisable to redose the dog about a month later in order to destroy the larvæ which were not in the intestine at the time of the first treatment.

Once again, treatment of the dog is of little use unless the yard is cleaned up and all precautions mentioned in connection with roundworms should also be observed in this case.

4. HEARTWORMS.

Unlike the previoulsly described worms which are all found in the intestines, heartworms, as the name implies, are found in the cavities of the heart, particularly those on the right side. They are not found in the heart muscle itself, but may extend along the vessels from the heart to reach the lungs in some cases.

The worm responsible, *Dirofilaria immitis*, is usually between seven and 12 inches long, about as thick as a piece of twine and is a dirty white colour. When it is realised that the average size of a dog's heart is little more than that of a tennis ball and that there may be up to 250 worms twisted up inside the cavities of that heart, to say nothing of the interference that is caused to the efficient functioning of the valves in the heart, the actual mechanical obstruction to the blood flow and the increased strain suffered by the heart as a result can be well appreciated.

The adult worms in the heart lay eggs which hatch immediately on reaching the bloodstream, into activity wriggling larvæ which are called microfilariæ. These are between two and three hundredths of an inch long and will not grow nor develop in any way until they have passed through an intermediate host which is usually a mosquito although it is argued but not proved that ticks and fleas can also act as vectors. The microfilariæ spend 15 to 35 days in the body of the mosquito and then migrate back to the mouth parts of their temporary host in readiness to re-enter the blood stream of the next dog upon which the mosquito feeds. Each mosquito may carry up to 30 or more of these microfilariæ at a time, and since each one of the microfilariæ may grow into an adult heartworm, the difficulty of complete control, even with the use of mosquito proof rooms is obvious. No matter how careful one is there is always the odd mosquito which will get through, and because of the very heavy incidence of the condition in Fiji, there is a very big chance that that mosquito would have previously fed from a heartworm infested dog.

On reaching the blood stream of a dog for the second time, the microfilariæ are able to continue with their development, and in approximately eight months they are found in the heart of the dog as mature worms. From the above description it will be seen that the life cycle of the heartworm is spread over nearly a year. This fact is very important for two reasons—Firstly, since there is no prenatal infection, heartworm is not seen in dogs until they are nearly a year old, and for practical purposes it can be stated that there is no need to worry about heartworm in a dog until it is over one year old. Secondly, since the treatment is usually highly effective, a single course of injections will keep the dog free from the dangerous adult worms for approximately a year.

As expected, the main symptoms seen are those attributable to faulty blood circulation. The dog tires easily and often after only moderate exercise, it is seen that the mucous membranes of the mouth and tongue are slightly blue instead of the normal pink colour. Very commonly there is a cough which is due to the worms actually extending into the lungs, or to fluids leaking back into the lungs as a result of the impaired circulation. In the later stages when there is considerable interference with the circulation it is very common to find that the abdomen and sometimes the hind legs are distended with dropsical fluid.

Treatment is effective but severe since the drugs used to "poison" the worms must actually be administered to reach the bloodstream and in the course of their action quite considerable damage is caused to organs in the body. Of these, the liver, kidneys and heart muscle are particularly affected, and although it is theoretically possible to go on treating a dog each year for heartworm, it is found that, as a result of the damage to the above organs each subsequent treatment becomes a greater risk for the dog and the chances of completing a successful course of injections diminishes progressively. For this reason, it is not always advisable to treat dogs regularly each year, although in some cases where a heavy infection is quickly built up after treatment, this might be necessary. It is dangerous to leave dogs too long after the 12 months in this latter case since treatment is often longer and more difficult where a heavy infection has been allowed to build up. For this reason it is advised that the dog be taken to a veterinary clinic every 12 months, and, depending on the results of the microscopic examination of the blood which is used in definitely establishing diagnosis, the clinician will determine whether treatment is warranted. Should the clinician decide against a course of treatment, it is advisable to retest the dog every three or four months.

Treatment consists of daily injections until microscopic examination of blood smears reveal that no more microfilariæ are present. These daily injections may take anything from 10 to 20 days and it is essential that once treatment has been commenced, it be continued to the completion of the course since no benefit is to be derived from an interrupted course of injections. Dogs are usually quite bright at the beginning, but may become a little dull towards the end of the course. The injections do not take long and owners bring in their dogs each morning as directed and then take the dog home for the rest of the day. No special treatment is required at home during the period, except that the dog should be kept fairly quiet, out of rain and draughts and observed fairly closely for any signs of sickness or depression which should be communicated to the clinician the following morning if noted. A light and nourishing diet is desirable since dogs frequently go off their food before the completion of the course.

As mentioned, chances of success diminish with each subsequent series of injections, but dogs have been successfully treated up to six or seven times.

It is interesting to note that *Wuchereia bancrofti*, which causes Elephantiasis in man is a closely related filarial parasite to *Dirofilaria immitis*, and while there is no cross infection of the canine and human parasites, it is actually the dog parasite which is usually used in the preparation of the allergin which is used in the skin test for diagnosis of filariasis in man.

(In the next article, skin complaints will be briefly dealt with.)

COMMON COMPLAINTS OF DOGS IN FIJI
PART 3—SKIN COMPLAINTS

BY K. J. GARNETT, B.V.Sc.

Broadly speaking, three main classes are responsible for most of the trouble in Fiji. These are:—

1. Eczema.
2. Mange.
3. Ringworm.

1. ECZEMA.

This condition is non contagious and is not caused by any specific parasite. It can be simply described as being associated with an alteration or upset of the proteins in the body of the dog. Whether this is caused by feeding certain foods to certain dogs at various concentrations, by focal infection or mechanical irritants such as germicidal or chemical soaps which alter the proteins in the skin itself will not be dealt with here since it is a very wide field, and it will be sufficient now to give a brief description of the symptoms seen and counter steps which might be of some use. It is emphasized, however, that some forms of eczema, owing to the very wide range of possible causes are very difficult to clean up, and even prolonged and varied treatment is of little avail in some of the more chronic cases.

Eczema can be further subdivided into moist and dry types.

(*a*) *Moist Eczema.*—This usually appears very suddenly. Dogs which have appeared quite normal the day before may be observed to have large patches where the hair is coming out and the skin beneath appears reddish with minute vesicles from which there is a serous exudation which gives the lesion a moist, sticky and glistening appearance. In the early stages, itching is not marked but the skin is usually extremely sensitive to the touch. The most commonly affected sites are along the back particularly near the base of the tail.

(*b*) *Dry Eczema.*—This also have a fairly rapid onset, but unlike the previous type, there is marked itching. Almost any part of the body can be affected, but once again, the predilection sites are along the back and at the base of the tail. In this form there is a papular eruption which becomes pustular and because of the marked itching, there is usually considerable scratching on the part of the dog which results in the skin being wounded and if bleeding occurs, scabs and crusts may be formed.

Counter measures are largely dependent on finding some cause. One of the most frequent causes in Fiji is the bathing of dogs with carbolic or germicidal soaps. Frequently a carbolic soap is used and when eczema lesions appear, the owner decides to use something stronger and so a mercurial or germicidal soap is used with even more disastrous results. The skin of a dog is very susceptible to such irritants which change the protein composition of the skin in the same way that boiling will change the composition of the proteins in an egg. There are many proprietary dog soaps of which some are good and others definitely irritant to the more sensitive skinned dogs. It is recommended that ordinary good quality washing soap be used. Many people bath their dogs too frequently. Admittedly, dogs are hard to keep clean in wet weather, but it will be found that more frequent use of a brush will result in most dogs requiring a bath not more than once every one or two weeks and for considerably longer periods in some dogs. Even dirt can be readily brushed out when it has been allowed to dry. It will also be found that regular brushing of the coat will result in a stimulation to the skin which will give the coat a better lustre: frequent washing washes the natural oils out of the hair and the coat is dry and harsh as a result.

Certain flea powders are also found to give trouble in some dogs. If DDT is used as a powder, it should be broken down with talc or flour so that the actual strength of the DDT used is about three per cent. Under no circumstances should dogs be sprayed with commercial DDT solutions since these usually have a petrol or kerosene base and both these substances are very

irritant to the skin themselves. It should be noted that cats are even more susceptible than dogs to DDT and it is advisable to break down the powder with even more talc if it is used on these animals.

If external factors such as irritants are eliminated, it is probable that the cause is internal and for this reason a change of diet is usually prescribed. If a dog is receiving cooked meat, change it to raw meat and vice versa. Cease, or commence to give milk, starchy foods such as rice, bread, vegetables, etc. Check on bowel movements, and if constipated use liquid parrafin at the dose rate of one teaspoon to two tablespoons depending on the size of the dog. Liquid paraffin is non habit forming and can be given at the full dose rate every morning until bowel movement is satisfactorily re-established, without any fear of a subsequent constipation as would be the case with castor oil.

Finally, local treatment, or the treatment of the lesions depends on the type and stage of the lesions. Some will respond well to certain mixtures which have no effect on others. On the whole, though, the author has had best results with oil of cade and zinc oxide mixtures which can be obtained from Veterinary clinics.

2. MANGE.

Two mange mites are responsible for most of the trouble in Fiji. These are *Demodex canis* and *Sarcoptes scabiei* var. *canis*.

(*a*) *Demodex* is in the hair follicles and sebaceous glands and as a result of the distension of the follicle, the hair falls out, and at the same time, a brownish exudate is seen. In some cases the spread is fairly rapid and pustules may be seen.

The condition is not very contagious since fairly close contact is needed for its spread.

Three main types are seen:—

(1) localized squamous form in which there are small well defined areas without hair. In white skinned dogs, it will be seen that the skin in these areas is reddened, and usually covered with a thin grey layer of scales. The usual sites for the infection are around the eyes and on the hocks elbows and neck. There is usually little if any irritation;

(2) diffuse squamous type is characterised by only some of the hairs coming out and larger areas of skin are involved. There is a brownish exudate at the base of the remaining hairs, and if the dog has a white coat, this exudate will cause it to become a dirty grey colour in the affected regions;

(3) the pustular type may follow on from either of the two types above or may develop immediately. If it follows the localized type there are small pustules which are hard to see in dark skinned dogs. Following the diffuse type, there may be extensive abscesses and the infection may extend along beneath the skin for some distance. The hair is dark, damp and matted and there are usually numerous scabs. There is quite a lot of itching and the condition is hard to clean up.

Diagnosis is definitely established by microscopic examination of a skin scraping which is cleared by heating with chlor-lactophenol to enable the mites to be seen clearly.

Treatment daily with derris is highly effective in the first two types and is also used in the pustular type with fair results. In addition, a weekly bath in which one ounce of potassium sulphurate is mixed in three gallons of warm water is of considerable use. It is also of assistance if the pustules are squeezed before treatment since the drugs often fail to penetrate into the skin deeply enough otherwise. In case where the eyes are involved, those lesions should be treated with citrine ointment.

(*b*) *Sarcoptes* usually attack the borders of the ears and around the eyes. Under the jaw, on the shoulders and elbows and on the outer surface of the hind legs are sites less commonly affected. The condition spreads rapidly, however, and may involve the whole body.

Unlike Demodex, it is very contagious to other dogs and it occasionally causes a " rash " in man.

The first lesions noted are small red papules which burst with the result that

the hair falls out and the exudate dries to form scabs. Each particular lesion is sharply defined and the dog presents a "motheaten" appearance. Itching is marked, particularly when the dog is in the sun.

Diagnosis is confirmed by microscopic examination of skin scrapings as in Demodectic infection. If the lesions are moist there may be some difficulty in finding the mites which are more numerous in the dry lesions. To facilitate the finding of the mites, a lot of material may be taken in the skin scraping, boiled with ten per cent potassium hydroxide solution, cooled and then the mites floated to the surface in a saturated sugar solution.

Treatment is to strictly isolate the dog and if it is long haired, to clip the affected regions and to bath weekly in a solution of potassium sulphurata as with Demodex. Daily local treatment with ointments containing derris or its active principle, rotenone, are effective as also are preparations containing benzyl benzoate and certain organic sulphur compounds such as Mittigal.

If itching is marked, a little chloretone added to the ointment helps considerably.

It is of little use treating the dog, if infection in the form of contaminated kennels and bedding is to remain. For this reason the kennels should be treated with a solution of potassium sulphurata and the bedding is better burnt. Clippings of hair should also be carefully collected and burnt.

3. RINGWORM.

This condition is caused by a fungus which most commonly attacks sites on the head, particularly around the eyes and on the face. The neck and lower part of the body are also frequently attacked.

The fungus causes the hair to break off close the surface of the skin leaving the typical bare lesions which, with the exception of those about the eyes, are usually circular, hence the name.

It should be noted that cats, dogs and man can be attacked by the same fungus so that particular care is necessary in dealing with it, especially when there are young children about.

Following on the loss of hair, a small crop of vesicles or pustules usually appear around the periphery or edge of the lesion. These later rupture and a sticky exudate runs down the skin to set up new foci of infection.

Diagnosis is sometimes confused with cases of mange but skin scrapings which are cleared with a warmed ten per cent solution of potassium hydroxide reveal the spores of the fungus.

Treatment is fairly effective in dogs but more difficult in cats and where young children are present every care should be taken that they do not have any contact with the animals, particularly cats. It should be remembered that the spores will be present in fur which falls out and might also be found on carpets and cushions. Any bedding which the animal uses should be burnt.

Eight per cent salicylic ointment is applied daily to the affected areas in dogs, but cats are more susceptible to the action of this drug, and should be treated with no more than a three per cent ointment.

POWERFUL NEW RODENTICIDE

A new rodenticide, *Castrix* (2-chloro-4 – dimethylamino – 6 – methylpyrimidine), said to be five times more toxic to rats than either "1080" (sodium fluoracetate) or *Antu* (*alpha-naphthyl thiourea*), was described by K. P. Du Bois of Chicago University at a recent meeting of the American Association for the Advancement of Science.

It was claimed that *Castrix* was readily accepted by rats and was lethal at a concentration of 1% in the diet, producing convulsions and death in 30 minutes after the ingestion of such a dose. Sodium pentobarbital was an effective antidote to accidental poisoning by *Castrix*.

Extract from Manufacturing Chemist March, 1948, XIX, 3.

LIBRARY NOTES . . .

RECENT AGRICULTURAL PUBLICATIONS.

Stockdale, Sir F.—"Factors of Agricultural Production in the British Colonial Empire": *Nature*, Vol. 161, No. 4088, p. 337.

A consideration of some of the factors which influence agricultural production under colonial conditions, dealt with under the following headings: climate, soils, water, systems of agriculture, use of livestock, crop varieties, pests and diseases of man and his stock and crops, marketing arrangements and social organisations.

Ellis, R. H., and Whittleston, W. G.—"A Study of Machine Milking Technique": *New Zealand Journal of Agriculture*, July, 1948, p. 49.

Wallace, G. B.—"The Establishment and Running of a Papain Plantation": *East African Agricultural Journal*, Vol. XIII, No. 4, April, 1948.

COMMITTEES

A Beef Supply Advisory Committee was appointed on 30th April, to review the present position of the beef supply in the Colony with particular reference to the supply of slaughtered stock to butchers. The membership of the Committee is as follows:—

Chairman.—Acting Senior Veterinary Officer.

Members.—The Controller of Prices, Messrs. C. Corbett, R. P. Little, Sardanand Maharaj, Harm Nam.

RICE AND MINOR ELEMENTS [1]

Nutrient solution experiments with rice indicate that it may be added to the list of plants requiring boron, manganese, and copper. Boron deficiency symptoms are distinctive, though resembling those due to a shortage of calcium in the chlorotic spotting of the leaves as they emerge at the tip. The first sign of manganese deficiency is a chlorosis of the mid-vein leaf areas resulting in striation of the young foliage. Plants deprived of copper showed no characteristic symptoms, but their weight was reduced in comparison with the controls. Supplementary experiments with boron demonstrated its indispensability for normal grain production; its utilization in the plant was shown to be related to the calcium supply.

[1] Higinbotham (N.) Some trace element deficiencies in Rice—Abs. in Proc. Ind. Acad. Sci., IV, p. 37, 1945. Recorded in Review of Applied Mycology, Vol.